medium in which they live, enables them, with comparatively little muscular exertion, to float on and near the surface of the water, and to breathe directly the air which is required in mammalian respiration. A feature in Cetacean anatomy is the great capacity of the thorax, the consequent large size and expansibility of the lungs, and the mobility of the ribs, which in the whalebone whales only articulate with the sternum by a single pair. The external configuration of the chest varies in different species; in *B. mysticetus* it is rounded laterally and somewhat barrel-shaped; but in the Finners it is more elongated in the dorsi-ventral diameter, and with a smaller diameter from side to side. In both forms it is capable of great expansion, so that the whale can dive to a great depth and remain under water for a considerable time, until the need arises to come to the surface to expire the contaminated air in the act of "blowing," and to take in a fresh supply.

In the chapters on classification, Mr. Beddard has very properly rejected many of the generic names introduced by the late Dr. E. Gray, who in his later life gave to each species a new generic name, and almost went so far as to regard each skeleton, or part of a skeleton, in the British Museum as representing a distinct species. He has adopted the more restricted nomenclature employed by van Beneden, Flower, Turner, and other recent cetological authorities. His descriptions of the specific characters are tersely put, and can be readily understood even by those who are not trained anatomists. The figures of the species, so far as he has provided illustrations, are characteristic, though in at least five instances his drawings have been made from the series of casts displayed in the Whale-room in the British Museum, the last administrative work discharged by Sir W. H. Flower, and not from the original drawings. We observe, however, that several of our British species are not figured; three species of Balænoptera, the Humpbacked Whale, the White Whale, *Lagenorhynchus albirostris*, and even the common Porpoise, except in its embryonic form, have not been included in the illustrations. This is much to be regretted, as one of the main objects of a semi-popular book of this kind should be to place in the hands of those who live at the seaside a work which will enable them to discriminate the species of whales, examples of which from time to time are stranded on our shores, and not to class them all together, as is too often done, as "bottle noses." How important it is to familiarise people who have some taste for natural history studies, with the means of recognising specific differences, is illustrated by Sowerby's Whale. The first example of this Cetacean was described by James Sowerby from a specimen stranded in 1800 on the shores of the Moray Firth. No further specimen was recognised in Scotland until 1872, since which date two specimens have been obtained in the Shetland Isles, two in the Firth of Forth, and in September of last year Mr. William Taylor secured three specimens—male, female and young—stranded in the Moray Firth only a few miles from the spot where Sowerby's original example was found. On the English coast a specimen was got in 1885 at Spurn-point, and another in 1892 at Overstrand, near Cromer; but we know of only one specimen identified on the coast of Ireland. It is obvious, therefore, that this Cetacean is not so uncommon as was originally supposed. When those who dwell by the sea become more alive to the recognition of the specific characters of whales, we may reasonably hope that other species, now considered rare, may be found to be not infrequent visitors to our shores.

RESEARCHES ON GLYCOGEN.

Microscopic Researches on Glycogen. Part ii. Glycogen of Snails and Slugs, in morphological and physiological correspondence with the Lymph System of Vertebrates. By Charles Creighton, M.D. Pp. 127; 9 coloured plates. (London: Adam and Charles Black, 1899.)

PART I. of this work, which appeared about three years ago, treated of the physiological functions of glycogen. It contained a number of interesting records of microscopic work, and showed that glycogen is present in a number of situations, particularly during embryonic life, in which its presence was previously unsuspected. Claude Bernard, in his classical work on the subject, recognised the presence of glycogen in the placenta and many other embryonic structures, and Dr. Creighton amplified this by more numerous observations. As development progresses, and specialisation of function occurs, the glycogenic function is narrowed down to the liver and muscles instead of being widespread throughout the tissues. Dr. Creighton concluded, on what we regard as insufficient grounds, that the function of glycogen is much more important than physiologists have hitherto considered to be the case. He insists on its "formative" function, by which we suppose he means that it is an all-important or even essential substance in the construction of living matter, and he even assigns to it a respiratory function, believing that in early life it takes the place of hæmoglobin. His proofs of its oxygen-carrying capacity were even less complete than those of its formative properties.

All physiologists admit the importance of glycogen; they would require very stringent evidence, however, before they admitted that it is essential to the formation of protoplasm, or that a carbohydrate is capable of doing the work of a complex nitrogenous and iron-containing material like hæmoglobin. It is regarded rather as a storage or reserve product, part of the cell-contents rather than part of the cell-substance, and its use is doubtless principally by its subsequent combustion to contribute to the liberation of energy in the form of molar and molecular movement, work and heat.

In Part ii., which is now before us, we have as before a very elaborate series of microscopic observations, undertaken with infinite pains, and illustrated by excellent drawings. It treats of the various invertebrate classes, and shows the presence of glycogen in numerous situations; the work of others in the same connection has been collected with care. The proof that the substance is always glycogen would have been more complete if the observer had not limited himself to one test, namely, the micro-chemical reaction with iodine. Still, if we regard this as trustworthy, we have before us a valuable collection of observations which show how

widespread the distribution of glycogen is, and we may safely draw the conclusion that its function is extremely important.

As before, however, we hesitate to follow Dr. Creighton in his speculations regarding the nature of these functions. For in addition to its formative and respiratory functions, the multifarious duties of lymph are now ascribed to this single and comparatively simple material. The arguments that lead to this startling conclusion are extremely curious to follow. He finds that in snails and slugs which have been specially worked at, glycogen is chiefly deposited in certain connective tissue corpuscles, which are designated plasma cells. These are principally arranged along the course of the blood-vessels, and in some instances they form a complete coating to the vessels. This is considered to indicate the existence of a primitive lymphatic system. If this is so, there should be evidence in the higher molluscs that this becomes more perfect, and the different stages in the evolution of the lymphatic vessels should be capable of demonstration. There is, however, no attempt to do this; in fact, it is admitted that in the highest molluscs, the cephalopods, which have a very perfect vascular system with arteries, veins and capillaries, this arrangement of the plasma cells does not occur, and these animals have little or no glycogen in their tissues. Moreover, if the arrangement and chemical construction of the plasma cells of the snail has the great morphological value attached to it by Dr. Creighton, it is remarkable that it is not found throughout the class of gastropod molluscs, to which the snail belongs; it is apparently limited to quite a few members of the group. So much importance is attached to this idea by the author, that he almost seems, though his words are not quite clear on this point, to assume that the snail and slug are, in the line of descent, very near ancestors of the vertebrate family. There is no attempt to show the links in the chain, nor to explain why an exceptional and almost accidental arrangement of connective tissue cells in one or two isolated molluscs should confer this honour upon such isolated specimens. We do not think that a theory of this kind will do much to shake the thoroughly well-grounded work of Haeckel and other morphologists.

To the physiologist the next conclusion drawn will be even more startling; it runs as follows: if the plasma cells represent a lymph system, the glycogen of those cells must represent lymph. It hardly seems worth while to argue against such an unwarrantable suggestion. Any other constituent of the plasma cells might equally well have been selected. Lymph is a complex fluid acting as a middle-man between blood and tissue elements; it is contained in spaces between and around the cells, not in the interior of their cell-substance. If one seeks for an analogy between the two mobile fluids of the vertebrate, in the invertebrates it will be found much more easily in many members of the worm group which have coloured blood in their vessels, and colourless fluid in certain parts of their body-cavity.

Dr. Creighton's production, therefore, though interesting as a record of observations, is most disappointing so far as conclusions are concerned. Wide, sweeping, almost revolutionary theories are advanced without a shred of real evidence to support them. If the book serves no other purpose, it will at least act as a warning example of the danger of drawing hasty generalisations from imperfect data, data gathered from the exclusive study of one particular small point with one exclusive method.

OUR BOOK SHELF.

The Elements of Alternating Currents. By W. S. Franklin and R. B. Williamson. Pp. 212. (New York: The Macmillan Company. London: Macmillan and Co., Ltd., 1899.)

IN this book will be found a very fair *résumé* of the theory and practice of alternate current working, and of the modern developments associated with the use of polyphase currents and the induction motor.

It is interesting to compare a work such as the present, characteristic as it is of American methods, with similar works published in this country. Messrs. Franklin and Williamson's treatment of their subject is distinguished by conciseness, and by the almost total exclusion of anything of historical interest, though the authors, in the preface, acknowledge their great indebtedness to Steinmetz, "whose papers are unique in their close touch with engineering actualities." The beginner will, perhaps, find that the brevity of treatment renders the theory, and the usually excellent graphical constructions, here and there obscure. But, on the other hand, the comments upon the practical aspect of each question taken up are of great value, especially to readers in this country, where experience with polyphase currents is limited to some half dozen installations of but few months standing.

Continental engineers, accustomed to use the well-known Hartmann and Braun instruments, will be astonished to learn that "the only hot-wire instrument which is much used is the Cardew voltmeter." Under the heading "Revolving Contact Makers," the only form described is that using a jet of conducting liquid making contact with a revolving pin connected through the shaft of the alternator; while the much more convenient form with two brushes and a revolving piece of metal let into an insulating disc, which enables an electrostatic voltmeter to be momentarily connected across *any* two points in the alternator circuit, is not mentioned.

The chapters relating to the theory of the synchronous motor, the rotary converter and the induction motor contain information not easy to find elsewhere in accessible form. The short concluding chapter on the transmission of power, however, lacks a simple statement of the relative amounts of copper required by different systems of electrical transmission, and the respective merits of these systems as regards regulation.

Much information is to be found in this book in small compass, and it will prove of value to engineers engaged in alternate current practice. D. K. M.

Oysters and Disease: An Account of Certain Observations upon the Normal and Pathological Histology and Bacteriology of the Oyster and other Shellfish. By Profs. W. A. Herdman, D.Sc., F.R.S., and R. Boyce, M.B. Lancashire Sea Fisheries Memoirs. No. 1. Pp. 60; 8 plates. (London: George Philip and Son, 1899.)

THE monograph before us gives the results of three years' work by the authors on oysters and disease. This thesis is, of course, by no means new to either the general scientific reader, the medical officer of health, or, indeed, the general public. Oysters have for several years been suspected, and, indeed, in some cases almost proved, to be the source of typhoid fever. A most interesting report was issued upon this subject by the Local Government Board, which, if the reviewer remembers rightly, was